TO VESALIUS ON THE FOURTH CENTENARY OF HIS *DE HUMANI CORPORIS FABRICA*

By CHARLES SINGER

The month of June 1943 marks the fourth centenary of an event memorable for the anatomist; but it does more, it marks a period for the history of science, and indeed for the whole of modern civilization. In June 1543 there appeared at Basel, from the press of Johannes Oporinus (Johan Herbst, 1507–68), the *De humani corporis fabrica* of Andreas Vesalius (1514–64). It is the earliest book to present systematically new knowledge won by observation in what is immediately recognizable as the manner of our own day. It is, in fact, the first great work of modern science.

The time was noteworthy for its scientific output. Thus only a few weeks earlier appeared the *De revolutionibus orbium celestium* of the Pole, Nicolas Copernicus (1473–1543), who died as it was going through the press. A few weeks before that, Leonhard Fuchs (1501–66) issued at Basel his great *Historia stirpium*, most beautiful and famous of herbals. Neither is at all comparable to the great work of Vesalius. In the following century revolutionary ideas were advanced in the name of Copernicus, but, of a truth, his book is in no way modern. It is conservative in method, scholastic in tone, and hardly at all based on observation, though, as things transpired, it was the starting point for modern astronomy. Fuchs, an accurate, scholarly and industrious observer, set a standard for plant illustration which, perhaps, has not since been passed, but he exhibits no trace of that great creative drive distinctive of scientific genius. Indeed, in the whole of his own century Vesalius had only two peers with whom his great spirit could have joined in equal converse. One was Leonardo da Vinci (1452–1519), who died when Vesalius was five; the other was his own countryman, Simon Stevin of Bruges (1548–1620), who was not sixteen when Vesalius ended his life on a Greek island. Even these men do not measure by Vesalius either in completeness of achievement or in influence on the generations that followed. In his own century Vesalius walks alone. It is a fair statement that the modern period of science opens with his great book.

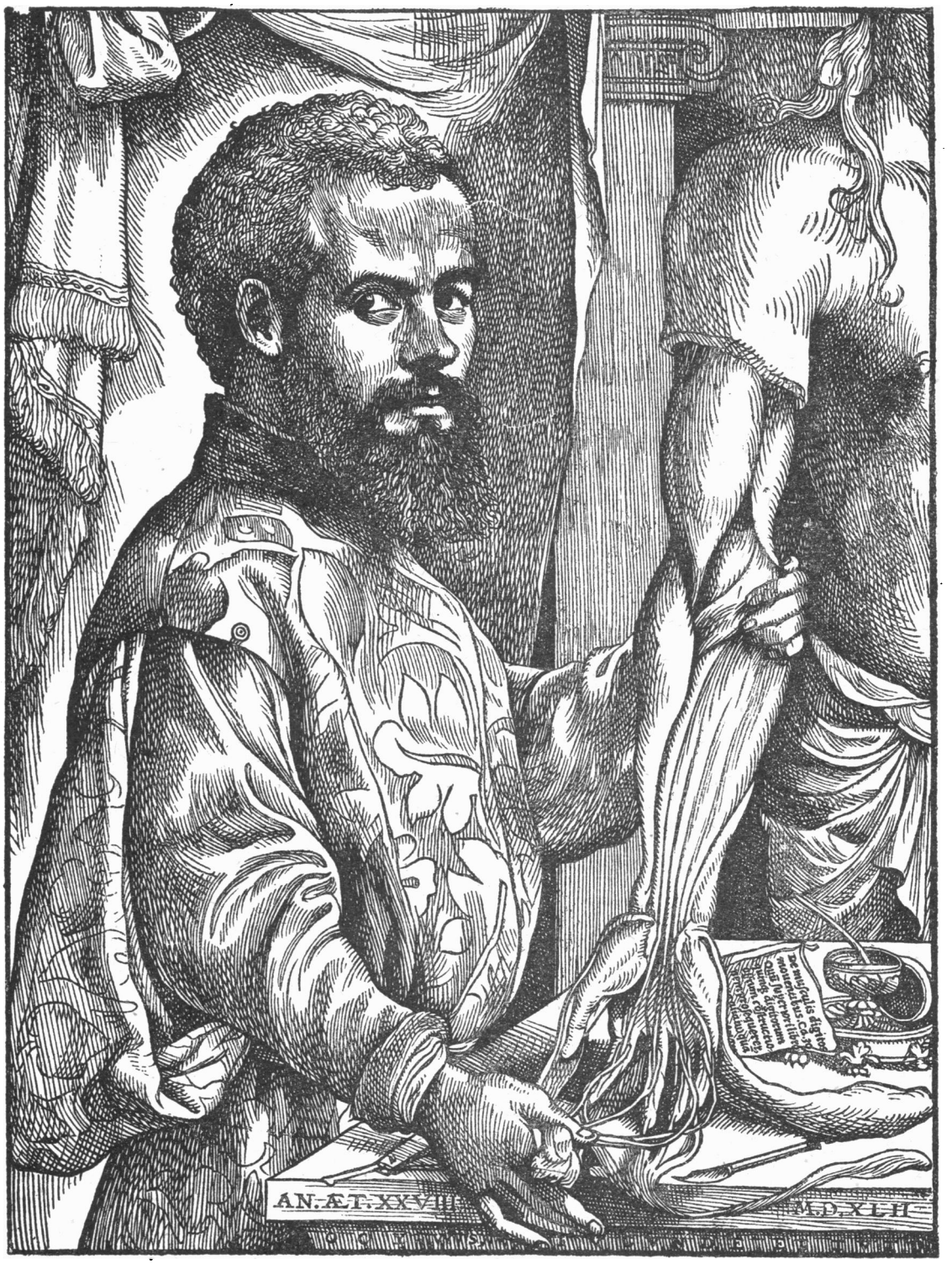
André Vésale—that was the real form of his name—was born at Brussels in the night between 31 December 1514 and 1 January. His father was Apothecary to the Emperor Charles V to whom Andreas was later Body-physician. His mother was perhaps of English extraction, for her maiden name was Isabel Crabbe. He says himself that, as a lad, he was constantly dissecting bodies of animals. Such tastes are common enough with boys nowadays. Nature study is taught in schools and it is easy to get help from books. But the study of nature was then little regarded and there were as yet no such books. Vesalius had to find his own way.

He studied at the Universities of Louvain and Paris. Both were strongholds of academic conservatism. At both the teaching of anatomy was quite medieval in manner and substance. The professor, when lecturing, mounted into his *Chair*, a great elevated structure like a pulpit and provided with a reading desk. Thence he read from the text of Galen—hence the academic title *Reader*—commenting on it as he went, while a junior colleague, the *Ostensor*, indicated the line of incision and a menial *Demonstrator* did the actual dissection. All was thus done third hand and according to the written word. By 1537 Vesalius had quarrelled with his teachers and their methods, had shaken the dust of Paris from his feet, and had made for the land of humanistic light, Italy. There in 1538 he issued the first of his works that shows traces of the scientific spirit. It is in six sheets and known as the *Tabulae anatomicae*.

The six tables are of very large folio size and were drawn by a pupil of the artist Titian, Jan Stephen van Calcar (1499–1546), who arrived in Italy about the same time as Vesalius. These splendid diagrams show many details that can have been learned only by careful dissection, but the spirit of Galen still broods over them. Thus, for example, they still ascribe to the human body the five-lobed liver of the pig, the rete mirabile of the calf, the long hepatic vein and the truncus brachiocephalicus of the dog, the long, protruding coccyx of the ape, the sternum in seven segments of an ungulate, together with the venous system arising from the liver of Galen's imagination.

While these *Tabulae* were in the press Vesalius was appointed professor of 'the surgical part of medicine' at the University of Padua. He protests, in the preface of his great book, that medicine can be effective only if firmly based on anatomy, and that to this subject he had therefore resolved to give his main attention. To make anatomy the positive basis of medicine was itself a very great reform, but he did more, for he changed completely the whole content and tradition of anatomy itself. His fundamental reform was to do away with 'demonstrators' and 'ostensors' and to put his own hand to the business of dissection. He was soon gathering large audiences. His lectures were given on the human body itself, displayed with his own

ANDREAE VESALII.



hands and with living models, drawings and skeletons at hand. Animals, too, were available for experiment and to illustrate special points. There can be no doubt that, not infrequently, he had to content himself with animals rather than the human subject for many anatomical details.

Vesalius was now master in his own department. His great research was carried out with an almost fierce energy. Every line and every figure of his epoch-making book, the product of but five years' activity, is instinct with his virile power. He was still but 28 when it was issued at Basel, almost simultaneously with a companion *Epitome* intended rather for artists than anatomists. With this his life work was completed. A second edition appeared in 1555 and contains definite improvements but no fundamental changes. From 1543 onward anatomy becomes Vesalian, while Vesalius himself passes into the background. We shall not follow his life further for it is not of first importance for the history of anatomy. For that, Vesalius and his great treatise are one. Without the book he would be but a ghost.

It may be pointed out that the name of Vesalius has hardly any place in anatomical nomenclature. In this he differs from many great anatomists. It is just that it should be so, for he has impressed his personality on the whole *fabrica*. That word needs some elucidation. It must by no means be translated 'fabric', and even 'mechanism' hardly renders it. In its ancient classical usage it means 'an artisan's workshop', essentially a place where something is going on and, by transference, the art or trade itself. This meaning is reflected in modern German *Fabrik*, factory, but better in modern French *fabrique* which means both the process of making and the place where things are made. In Renaissance Latin too the word has a kinetic meaning. I think a good—if unliterary—rendering would be 'works' or 'workings'. *De humani corporis fabrica*, 'On man's bodily workings'. Remember the book was both physiological and anatomical, for Vesalius was always trying to describe living anatomy. I can believe, therefore, that anatomists may still have something to learn from his figures, for he had an artist's eye, if ever a man had.

Moreover, not only was Vesalius a student of living anatomy but, as a corollary, it was always the body as a whole that was in his mind. This vision of the living *fabrica* made him a great creative anatomist, but it made him, at the same time, a great creative artist. Yet this vision makes his work difficult reading, for to understand it we must rid ourselves of certain ideas that come to us nowadays almost instinctively. To understand him we must think as renaissance artists and not as modern evolutionists.

The modern scientific biologist deals primarily with description and secondarily with origin. He takes an organ or part or function or reaction or group of organisms for its own sake and investigates it in detail. Then he treats it comparatively and then ontogenetically and then phylogenetically. His thought is always saturated with evolutionary implications. Nor is this the case only since Darwin, for evolution was implicit in biological thought long before him. But with Vesalius it is not so. For him the body is a *fabrica*, a piece of living workmanship, made by the Great Craftsman. The parts must be considered always in relation to the scheme as a whole, must be treated as contributing to that complex that we call a man. Thus, for example, his great general figures of muscles or of bones are not diagrammatically displayed from front, back, and side, but posed as in the living body. They are given tone and movement and provided with a background such as that which they have in life. Again in the figure of the vertebral column, the bones are not displayed in diagrammatic succession but an attempt is made to arrange them in the curves that they present in the living subject. This method is used with all the artist's skill and was his own. We need not discuss the share that Calcar or any other artist had in the actual drafts. For our purpose this is irrelevant, since the artist's mind that conceived them was clearly that of Vesalius.

Moreover, Vesalius, child of his age, could not, even as anatomist, help thinking of the end for which man was made. If he was deeply influenced by Renaissance Art he was also the product of the Revival of Learning. He was steeped in Galen, nor could he shake off Galenic teleology even if he would. But, with an artist's mind and eye, Vesalius transformed that moss-grown scheme into something characteristic of his time and his genius. For him man is a work of art, God an artist. He had in him little of the philosopher, the theologian or the poet, nor must we seek in his pages for any skilled or formal justification of his teleology. But so much he says, and says well, over and over again. Men and women he saw as the Great Artist's studies for His grand design of His own image. Imperfect studies, indeed. Vesalius, unlike Galen, did not harp constantly on the perfection of man's form. He had before him bodies of criminals, worn-out paupers and those wasted by disease, yet shadowing a unique conception in the mind of the Godhead. It was for the anatomist to reach closer than those poor corpses to the type of perfection. We think of anatomy in terms of evolution, and our questions are always 'Whence?' and 'How?' Vesalius thought in terms of design, and his questions were 'Whither?' and 'Why?'

The vigorous, teeming mind of Vesalius presented another and less attractive aspect. He was very learned, well acquainted with the new-found wealth of antiquity which the Humanists were making more accessible to the reading public. There was no

element of modesty in his psychological composition. He makes a tremendous display of his erudition, and it is sometimes slightly spurious. His books are full of Arabic and Hebrew words. To these he was helped by other scholars, and of those languages his knowledge was, in fact, of the slightest. But we must remember the age in which he lived. The great intellectual battle between 'Arabists' and 'Humanists' was still fierce. The issue was still far from clear. Thus the constant reference to Arabic and Hebrew was something more than mere vain show, though it must be allowed there is much of the showman in Vesalius. With the Greek language, however, he had considerable facility. So far as his reading in the available Latin translations of the Greek, Arabic, and Hebrew classics was concerned, there can be no doubt that he was highly accomplished and more critical than most in his time.

The anti-Galenism of Vesalius has been overestimated both by himself and by others. In the very years in which he was most busily occupied on the *Fabrica* his leisure was largely devoted to editing Galenic works. The Galenism of his *Tabulae anatomicae* (1538) certainly represents a comparatively early stage in his development, but not so his editions of works of Galen himself. For the great edition of Galen, produced by the printing firm of Giunta at Venice in 1541 and the following years, Vesalius edited the works *On the dissection of the nerves*, *On the dissection of the veins and arteries*, and the very important treatise *On anatomical procedure*. Moreover, the numberless references to Galen in the *Fabrica* exhibit his respect for his greatest predecessor who died twelve hundred years before he was born. Indeed, it was hardly open to him to do other than build on Galen. The Galenic works, accessible to him in good modern versions, presented by far the best current anatomical accounts. The tone of much of his criticism of Galen is not that which a modern writer would be allowed to adopt, but it was well within the taste of the time. It is thus not remarkable that many Galenic anatomical terms entered the anatomical vocabulary of Vesalius. Many more he borrowed from contemporary humanist physicians, but some he invented for himself, among them, for example, *Atlas* (as applied to the first cervical vertebra), *Alveolus*, *Choanae* (in the modern connotation), *Corpus callosum*, *Incus*, and *Mitral Valve*.

We must, then, think of Vesalius as trebly equipped for his task; first, by a wonderful native genius for anatomical observation and classification; secondly, by great powers of imagination, exalted by contact with high models of Renaissance Art; thirdly, by an admirable education, according to the standards of the time, directed along humanist lines by some of the ablest medical humanists of the day. But we must also think of him as most happily constituted for his task by the *lack* of certain qualities which would have handicapped him in that age. He was not interested in philosophical or theological problems. He was not at all given to the drawing of those vague physical analogies characteristic of the men of his time who borrowed many such ideas from Aristotle. He was saved from diversion into the miraculous or magical by a mind full of what he actually saw and did. He was a thorough extrovert of stable, unsubtle, restless, constructive mind with an artist's eyes, hands and imagination, the very type and exemplar of the modern man of science.

The portrait of Vesalius which first appeared in his *Fabrica* has attracted an immense amount of attention and no little undeserved adulation. In putting it again before the reader I ask him to approach it as though he was seeing it for the first time, for I have endeavoured to approach it myself in that fashion.

It is obviously a 'speaking' likeness of a real man. The great head seems full of energy. Eyes and mouth suggest quick wit and ready humour. It is the facies of a man of action, and it is easy to feel that this is one who could construct the great book. But, apart from the head, the drawing seems to me execrable. The perspective is wrong throughout. The relative proportions of hand, forearm, upper arm, body, and head are impossible. The right hand is without a wrist. The body that he is dissecting is that of a giantess of some seven feet or more and her hand is three times the size of Vesalius's own. Even the rendering of the scroll on the table contains childish blunders.

I am quite unable to believe that this picture was composed by Calcar or by any competent or adequately trained artist. No pupil of Titian could possibly have so botched his anatomy. The history of the picture seems to me to be quite plainly written on it. Some good artist—Calcar or another—drew or painted a *head* of Vesalius. This was recognized as a success and it was placed in the hands of a woodcutter, who received directions from Vesalius as to the setting in which it was to be placed. The craftsman copied the head slavishly, line for line and point for point, and finished by putting it in a composition of his own, which is obviously not the work of a trained artist. Vesalius himself must have provided him with a drawing of the anatomical details. (That Vesalius was a good draftsman we know on other grounds.) Vesalius was pleased with the picture as a whole for he reproduces it several times. The reason for his satisfaction was, I am sure, the extremely happy treatment of the head.

There remain a few details to elucidate. On the top edge of the column or table is inscribed the phrase AN[NO] AET[ATIS] XXVIII—MDXLII so that the figure was engraved the year before the publica-


ANDREAE VESALII
BRVXELLENSIS, SCHOLAE
medicorum Patauinæ professoris, de
Humani corporis fabrica
Libri septem.
CVM CAESAREAE
Maiest. Galliarum Regis, ac Senatus Veneti gratia &
priuilegio, ut in diplomatis eorundem continetur.

BASILEAE.

tion of the book and in his 28th year. Below is indistinctly inscribed OCYUS IUCUNDE ET TUTO. This I take to be a memory from Celsus who quotes Asclepiades as saying that treatment should be *tuto, celeriter, jucunde* 'safe, swift, seemly'. The writing on the scroll remains a puzzle. It is an inaccurate transcript of the first sentence of Book I, Chapter 43 (*not* chapter 30 as stated), p. 304 of the great treatise. The character of the errors suggests that the woodcutter knew no Latin and perhaps could barely read. The passage in the treatise corrects Galen's view of the flexor apparatus of the hand. Its insertion in the picture is perhaps intended to indicate opposition to him. Galen was particularly interested in the hand and wrote on its structure in great detail, drawing his knowledge of it from the hand of the Barbary ape. Vesalius specially records his improvement on Galen's treatment of the subject in the Preface to the *Fabrica* (p. 4).

The Frontispiece of the *Fabrica* is in a very different position to the portrait. It was in all probability from a design of Calcar. Like the portrait it is a woodcut, not a copperplate. It is ranked by connoisseurs very high in its class alike in conception, arrangement, character, drawing, 'colour' and cutting. Much symbolism has been discovered in it and all or nearly all, in my opinion, unnecessary, misplaced, and mistaken. Vesalius was not at all given that way. He had a taste for satire, caricature and whimsy—witness his very entertaining historiated initials,—but symbolism—No!

It is a very crowded and animated scene. Vesalius stands in the centre of a circular domed building. On the table before him is a partly dissected female body and an articulated skeleton. He demonstrates to an assembly of some eighty persons, placed in three tiers, separated from each other and from the central group around him by a series of three bars.

In the foreground is a group of menials. Two sharpen instruments, one holds a panting dog and another a chained monkey which a student is teasing. There is no reason to give any symbolical meaning to these animals for Vesalius used their anatomy to illustrate his book. Around him are gathered persons of importance. On his left a bearded sage gazes intently at the dissection. The old man on his right pulls his writing tablet from his pouch. On the opposite side of the table another patriarch motions the servants to silence. Third to the right of this tactician is a figure wearing spectacles which had become quite common at that date.

Behind the first two bars are crowded younger and mostly hatless students. Their faces indicate close attention. To the extreme right is a listener in monastic garb and in front of him a bearded student holds a large eyeglass. On the lateral pilasters are two figures with which the symbolists have greatly disported themselves. That to the left is a thin elderly man whose muscular outlines are conspicuous. I suggest that he is a model used for surface markings. His opposite number on the right is a young rake wearing dandified slashed hose. Hat over eyes, he is giving what seems to me a tipsy lurch. He is, I believe, up to some mischievous prank of which the monk in front of him tries to look unconscious.

The hindermost tier is perhaps the most interesting. The figures here represent the lay public and those of other faculties, some in outdoor dress, drawn to listen to this ornament of the university. What will he say next? Some are arguing together. Most are less attentive than the students in front. One pernicketty young scholar has brought a volume of Galen in which he and another follow the text closely. They will certainly detect divergence from it during the demonstration. To the right of these two stands another solemn, not to say somnolent, monk. Between the pillars at the back a few ladies may perhaps be seen. Heads peep through the clerestory windows at the top. Between them two putti support an heraldic shield on which are three weasels, the emblem of Vesalius.

Does this picture represent a real building and was there ever an anatomical theatre at all like this at Padua? It has been much discussed. In my opinion the answer is a definite negative. There is no record of any special anatomical theatre at Padua till one was built in 1583 when Vesalius had long been dead. I believe that all these architectural features are drawn from the always expansive imagination of Vesalius. We do not know where he did most of his dissection, but I think I can make a fair guess as to the place that he had in mind for this scene. In the quadrangle that makes up the old university buildings at Padua there is, in the wall opposite the entrance, a large apse. This is a natural meeting place for discussion and its form and setting is reminiscent of this imaginary Temple of Anatomy. I believe that is what he has in mind and I believe that what is drawn here is a hope and not a fact. The apse, much more modestly rendered, appears as the scene of an anatomical demonstration in the *De re anatomica* (1559) of the successor to his chair, Realdo Colombo (1516–59), a man of little talent or imagination. Had the Anatomical Temple of Vesalius been a thing of stone and mortar, records and traces of it would certainly have come down to us. But this great book is a more indestructible and more permanent memorial than any building could ever be. On one of the most beautiful and famous of the anatomical figures in it, he has had inscribed

VIVITUR INGENIO: CETERA MORTIS ERUNT

Whatever in him was unreality or error may perish, but his genius is, for all time, alive in this book.